

The best anchorage (except during the strong Norths) is about three-quarters of a mile N.W.b.N. of Shepherd's village, in four and a half fathoms dark mud, with Point Arenas N.N.E. about three-quarters of a mile. During strong north winds vessels may find snug shelter to the south-eastward of Point Arenas, towards Point Mandeville, a bluff woody point, nearly half a mile W.b.S. of Point Arenas. To gain the anchorage pass about a mile to the northward of Point Arenas upon a south-west course, and when the houses of the village bear S.E.b.S. steer for them, and anchor when in four and a half fathoms, as above directed. The soundings are extremely regular, shoaling very gradually towards the shore.

TIDE OBSERVATIONS IN THE NORTH SEA.—*Verification of Professor Whewell's theory.*

H.M.S. Fairy, Harwich, August 31st, 1840.

SIR.—On the 24th instant, being in latitude $52^{\circ} 27' 30''$ north, longitude $3^{\circ} 14' 30''$ east, with light breezes and smooth water, I deemed it a fitting opportunity for making a further trial on the rise and fall of tide in the middle of the North Sea; and although I was then many miles both to the northward and eastward of the spot, near which Mr. Whewell had previously expressed his wishes that the experiment should be made, yet I thought that if good observations by any means could be obtained at the above position, they would, at the least, serve to shew in some measure the truth or error of that gentleman's theory; either in the one case by a sensible diminution of the vertical movement of the tide, when compared with the known rise and fall on the shores of England and Holland, or in the other by ascertaining the rise and fall beyond a doubt to be so great, as to throw some doubt on the correctness of the theory in question. But, as I apprehend that Mr. Whewell's theory is founded mainly upon the fact, that the tide waves to make high water on the opposite coasts of England and Holland, come from different directions, namely, on the former round the northern extreme of Great Britain, &c. working its way along the eastern coast, and on the latter through the straits of Dover, and running thence along the coasts of France, Belgium, and Holland, and that it might be reasonably inferred that these waves gradually diminish in importance as they recede from their respective shores, or approach each other, there would be left a broadish space about the middle of this part of the North Sea, where no rise and fall exists, and that therefore the waters between the two opposite shores, would assume a convex form at low water by the shores, and a concave one at high water.

Allowing this view of the foundation of Mr. Whewell's theory to be correct, (and I have not his book at present near me to refer to,) this line, or more properly speaking "broad belt," of no rise and fall, would doubtless run for a considerable distance in the north-easterly direction into the North Sea side of the straits of Dover. It would therefore follow, that the fact of my being to the northward of Mr. Whewell's position, would of itself be of no material importance, and by reference to the chart, it will be seen that the longitude places me not many miles to the eastward of the "broad belt" above alluded to. Having

thus reflected, I came to the conclusion that, if Mr. Whewell's views were correct, true observations made in this position would exhibit some indications thereof, and I accordingly made the necessary dispositions.

A rise and fall by the shore is a case which falls immediately on the conviction by the sense of sight; but to ascertain the fact of a vertical motion of five or six feet, in the middle of a great sea, and out of sight of land, is a solution of no small difficulty, and requires the exercise of many precautions to arrive at anything like true results. In making an observation of this description, we find two important obstacles in the way of obtaining these, namely, the stream of tide and the undulating character of the surface of the ground. Under the influence of a strong stream of tide it is utterly impossible, except in very shallow water, to take a strictly correct depth from the vessel, or a boat at anchor, (and therefore a fixed point,) for the line *will* assume a curved form in the act of descent, and after all, from the want of perpendicularity in the line, a large allowance in a depth of nearly twenty fathoms is necessarily left to the exercise of the judgment, and both of these may amount to considerably more than the "rise and fall" sought for. On the other hand, the undulation of the surface renders it essential that the depths should be always taken *over* some discovered elevated spot. The stream of tide, and the undulations of the ground, are therefore alternately opposed to the making of observations, from which direct results can be derived. I experienced on this, as on the former occasion, considerable difficulty in overcoming these obstacles, but I soon found myself compelled to resort to the former plan, (with the addition of such precautions as experience then gave me,) namely that of mooring one boat and taking the depths in another.

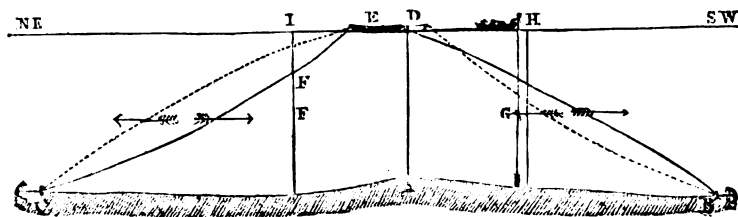
The accompanying diagram will assist my account of the plan pursued. The ship was anchored in twenty-one fathoms and a half, and on searching a convenient rise in the ground, A, was soon found near her, over which there was exactly eighteen fathoms three feet by a well measured line. The second gig, (of twenty-six feet,) was then moored "head and stern," in the direction of the strength of the stream, (north-east and south-west,) so that she should be as nearly as possible over the overfall A. This was accomplished thus, I prepared a coil of one inch and a half rope, and fastened a grapnel at either end. The first grapnel was let go at B. The whole of the line was then veered away, and the second grapnel was let go at C. The gig was hauled along the bight of the rope, until it was found by repeated trial, that the summit of the overfall was exactly abreast the foremost rowlock of figure D. at about six feet from the boat, while the north-east stream was running. She was then secured. At the turn of the tide to the south-west, it was found that the weight of the stream F had operated so powerfully on the bight of the north-east line, as to draw the boat from D to E, so that the summit of the overfall which was before under the foremost rowlock, was found to be eight feet on her bow. On the return of the north-east tide, its operation (G) upon the bight of the south-west line, again drew the gig ahead to her former position D, and the summit of the overfall was found as before, under the foremost rowlock.

It will then be evident that at each change of tide I knew exactly where the overfall was to be found, while taking the depths; and thus prepared it only remained to get the *least*, and *exact vertical* depth over the summit of the overfall, at the intervals determined upon, and which were every half hour. With the north-east stream running I dropped the lead from the other gig about the point H, and exactly in the stream, which I knew would drift her at the proper distance of six feet from the moored boat; the lead was constantly lifted off the ground, so that the line was perfectly straight and perpendicular; and the undulations of the ground carefully observed until the lead passed over the summit of the overfall where the depths were strictly noticed and recorded in the accompanying Table. The boat on this stream was allowed to drift to the point I, and terminated at H, using the same observances and precautions until 5h. 30m. P.M. of the 25th, when the appearance of the weather required my removing.

It will be seen that the observations recorded on the afternoon of the 24th, are not so regular as those of the following day. I attribute this to some degree of *uncertainty* on account of a long swell, perhaps of one and a half or two feet rise, interrupting the observation at the moment of passing over the overfall, but this little swell had nearly subsided on the 25th, and the depths were then recorded with much satisfaction. It will also be noticed that the turn of the stream about noon of the latter day, the depth had increased to eighteen fathoms ten feet, and went on uniformly so, but I investigated the cause of this on the spot, and found that the wind having increased to 2° from W.b.S., and therefore operating upon the starboard bow of the boat, had sidled her a few feet to the south-eastward, so as to bring the eighteen fathoms three feet under her; and that by observing the same distance from the boat while drifting past her, (and which was always on her larboard side,) I obtained eighteen fathoms four feet instead of eighteen fathoms three feet.

From the care and pains taken in these observations, and that under favorable circumstances, I do not entertain a doubt of the correctness of any one of the depths over the summit of the overfall as recorded on 25th, but as this interesting result of observations on an unexpected theory may no doubt give rise to a strong desire for further observations as corroboratives, I shall not fail to make such when I find myself in a position and circumstances to do so with any prospect of success. It is a difficult observation, and can be made but seldom. In the meantime I would offer my congratulations to Mr. Whewell on these results, should they prove in any degree gratifying to him.

WILLIAM HEWETT, *Captain.*



August 24th, 1840.—Lat. 52° 27' 30, Lon. 3° 14' 30" E) age 26-6.							
Times. H. M.	Depths. fms. ft	Direct (Comp)	Rate. Kts.	Winds. (Comp)	Force.	Remarks.	
1—	30	18—3½	N.E. ¼ E.	1.5	SW.	2	
		18—3	N.E.	1.4	"	—	
2—	30	18—2½	N.E. ¼ N.	1.2	"	—	
		18—2½	N.E. ¼ N.	1.0	"	—	
3—	30	18—2½	N.E.b N.	0.7	"	—	
		18—2	N.E.	0.5	"	—	
4—	30	18—1	N.E.b.E.	0.3	"	—	
		18—1	East	0.3	"	—	
5—	30	18—1½	Slack	0.0	S.S.W.	—	
		18—2	W.b.S	0.3	"	—	
6—	30	18—2½	SW.b.W.	0.7	"	—	
		18—3	SW. ¼ W.	1.4	S.b.W.	—	
7—	30	18—3½	"	1.5	South.	—	
		18—3½	"	1.5	S.S.E.	—	
8—	30	18—3½	"	1.6	SE.b.S.	—	
9—	30	Too	dark	for	observations.		
10—	30						
11—	30						
12—	30						
1—	30						
August 25t. —Same Station,) age 27-6.							
5—	30	18—3	Slack	0.0	Calm	0	
6—	30	18—3	SW.b.S.	0.5	"	—	
		18—3	SW.	1.7	"	—	
7—	30	18—3	"	1.0	W.b.N	1	
		18—3	"	1.3	"	2	
8—	30	18—3	"	1.5	"	—	
		18—3	"	1.3	"	—	
9—	30	18—3	"	0.2	"	—	
		18—3	"	0.9	"	—	
10—	30	18—3	"	0.5	"	—	
		18—3	SW.b.W.	0.2	"	—	
11—	30	18—3	Slack	0.0	W.b.S.	—	
		18—3	NE.	0.3	"	—	
12 noon		18—4	"	1.9	"	—	
P.M.	30	18—4	"	1.3	"	—	
1—	30	18—4	"	1.6	"	—	
		18—4	"	1.6	"	—	
2—	30	18—4	"	1.6	"	—	
		18—4	"	1.6	"	—	
3—	30	18—4	"	1.3	"	—	
		18—4	"	0.0	"	—	
4—	30	18—3½	"	0.5	"	—	
		18—4	"	0.3	W.S.W.	—	
5—	30	18—4	Slack	0.0	SW.	—	
		18—4	S.W.	0.2	"	—	
						Tide slack from 10 45 to 11 0	